

CHEMICALS

Success Story



POWDER PAINT COATING SYSTEM

Chrysler Reduces Air Emissions Using a Powder Antichip Primer Process

Benefits

- ◆ Reduced air requirements and ability to recycle process air leads to greatly reduced air-heating requirements
- ◆ Through 2000, the cumulative energy savings have been over 2.7 trillion Btu
- ◆ Through 2000, the cumulative reduction in NO_x emissions have been 210 tons and the cumulative reduction in CO₂ has been 162,000 tons
- ◆ Eliminates energy requirements for incinerating VOCs
- ◆ Contains no solvents, thereby reducing potential VOC emissions
- ◆ Higher transfer efficiency reduces overspray, virtually eliminating solid-waste generation

Applications

The new antichip primer process can be used for all transportation vehicles.

Project Partners

- ◆ Chrysler Corporation
Newark, DE
- ◆ Delaware Department of Natural Resources and Environmental Control
Dover, DE

The coating industry standard for applying antichip primer to vehicles is a solvent-based paint spray system. While effective, this system results in two waste streams. The first waste stream is the solvent from the paint, which is usually either exhausted into the air or collected and incinerated. The second waste stream is the particulate from paint overspray. The particulate waste stream is usually collected from a water-wash spray booth and landfilled.

In 1995 Chrysler and its partners, with the assistance of the U.S. Department of Energy's NICE³ (National Industrial Competitiveness through Energy, Environment, and Economics) Program, developed and implemented an innovative powder antichip painting process that contains no solvents and reduces energy requirements and solid-waste generation. To date, the new process has been implemented in 13 auto paint shops—9 at Chrysler and 4 at other auto manufacturers.



Conventional Primer Coating Process



New Powder Antichip Primer Process



The process of applying the powder antichip primer relies on electrostatic attraction between the powder and the vehicle to deposit the coating on the surface. Once deposited, the coating is baked in an oven until it cures.

The powder antichip process offers several benefits and significant energy and cost savings. The "full body powder antichip system" virtually eliminates solvents and therefore reduces the volatile organic compound (VOC) emissions at the plant. Most of the overspray resulting from the powder application is captured and recycled, eliminating the need for the water-wash scrubber. Considering recycling, the new process has an effective utilization efficiency (ratio of paint solids deposited to solids used) exceeding 99%.

At Chrysler's Newark, Delaware facility where this demonstration took place, annual solid-waste generation decreased from 600 tons to about 40 tons. Material, sewer, and water intake costs were also reduced. The facility reduced CO₂ emissions by 2,308 tons/year and NO_x emissions by 20,533 pounds/year compared with air contaminant emissions resulting from the traditional solvent-borne paint spray system.

In addition to environmental savings, the facility experienced significant energy savings. The powder booth for the antichip primer process is about half the size of the liquid spray booth so less energy is needed for ventilation, saving over 1 billion Btu/year at the Newark facility.

Because of the reduced solvent levels, 80% to 100% of the air in the powder booth can be recycled back into the booth. This approach greatly reduces the amount of make-up air to be heated, saving the facility an estimated 22.6 billion Btu/year. Similarly, because of the reduced solvent levels in the curing ovens, a significant reduction in ventilation requirements resulted in savings of about 2.6 billion Btu/year from these ovens. Finally, because reducing VOCs in the antichip process completely eliminates the VOC incineration process, the facility realized an additional savings of 14.4 billion Btu/year.

The total annual energy savings at the Newark facility from using the powder system instead of a liquid paint spray system is estimated to be 40.7 billion Btu/year. By switching to this process, Chrysler has realized total annual cost savings of more than \$350,000 per auto paint shop. The estimated total energy savings from auto paint shops currently using this process is 615 billion Btu/year.

INDUSTRY OF THE FUTURE — CHEMICALS

*The chemical industry is one of several energy- and waste-intensive industries that participate in OIT's Industries of the Future initiative. In December 1996, the chemical industry published a report, entitled **Technology Vision 2020: The U.S. Chemical Industry**, that helps establish technical priorities for improving the industry's competitiveness and develops recommendations to strengthen cooperation among industry, government, and academia. It also provides direction for continuous improvement through step-change technology in new chemical science and engineering technology, supply chain management, information systems, and manufacturing operations.*

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NICE³ – National Industrial Competitiveness through Energy, Environment, and Economics:
An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry. This grant program provides funding to state and industry partnerships for projects that demonstrate advances in energy efficiency and clean production technologies. Awardees receive a one-time grant of up to \$400,000. Grants fund up to 50% of total project cost for up to 3 years.

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